

T17D05 – (17.2) Further Equilibrium Law Notes

Name

1. 17.2.1 Solve homogeneous equilibrium problems using the expression for K_c . (3)

- a. Example #1: Nitrogen (II) oxide, NO, is a pollutant released into the atmosphere from car exhausts. It is also formed when nitrosyl chloride, NOCl, dissociates according to the following equation:



Different amounts of each of the reactants were studied at two different temperatures, 503K and 738K.

Temperature (K)	Concentration (mol dm ⁻³)		
	NOCl	NO	Cl ₂
503	2.33x10 ⁻³	1.46x10 ⁻³	1.15x10 ⁻²
738	3.68x10 ⁻⁴	7.63x10 ⁻³	2.14x10 ⁻⁴

- i. A: write the expression for K_c

- ii. B: Calculate K_c for both temps given

- iii. C: Is the forward reaction endo- or exo-thermic? (base it on Topic 7 ideas)

- b. The acid-catalyzed hydrolysis of ethyl ethanoate can be achieved by mixing the ester with dilute hydrochloric acid

$\text{CH}_3\text{CO}_2\text{H(l)} + \text{C}_2\text{H}_5\text{OH(l)} \xrightleftharpoons{\text{H}^+} \text{CH}_3\text{CO}_2\text{C}_2\text{H}_5\text{(l)} + \text{H}_2\text{O(l)}$

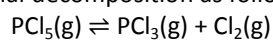
If 1.00 mol of both ethyl ethanoate and water are mixed, in dynamic equilibrium 0.30 moles of ethanoic acid is found in the mixture

Calculate K_c at this temperature:

- c. An organic compound X exists in equilibrium with its isomer, Y, in the liquid state at a particular temperature
- $$X(l) \rightleftharpoons Y(l)$$

Calculate how many moles of Y are formed at equilibrium if 1 mole of X is allowed to reach equilibrium at this temperature, if K_c has a value of 0.02

- d. Phosphorous (V) chloride undergoes thermal decomposition as follows



The equilibrium expression is as follows:

$$K_c = \frac{[PCl_3] [Cl_2]}{[PCl_5]}$$

Some PCl_5 was placed in an evacuated flask of volume 1.0 dm^3 at 500K.

An equilibrium was then established in which the concentration of PCl_5 was $4.0 \times 10^{-2} \text{ mol dm}^{-3}$.

The value of K_c for the reaction at 500K is 1.00×10^{-2} .

Calculate the concentration of chlorine in the equilibrium mixture